California Department of Public Health – October 2011

Laboratory Testing: Mumps

The California Department of Public Health (CDPH) Viral and Rickettsial Disease Laboratory (VRDL) encourages submission of specimens from suspected mumps cases who meet the CDC clinical case definition.

CDC mumps clinical case definition

An illness with acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary gland(s)*, lasting at least 2 days, and without other apparent cause.

*Because up to 1/3 of infections do not cause clinically apparent salivary gland swelling and may manifest primarily as respiratory tract infections, close contacts of confirmed cases who have symptoms of respiratory tract infection may also be considered for testing.

Mumps laboratory confirmation

Mumps infection can be laboratory confirmed by:

- positive serologic test for serum mumps IgM antibody; OR
- four-fold rise between acute and convalescent titers in mumps IgG antibody; OR
- isolation of mumps virus; OR
- detection of viral RNA by reverse transcription polymerase chain reaction (RT- PCR)

Specimen collection

Collection of a serum specimen for serologic detection of mumps antibody in conjunction with obtaining a buccal swab for molecular determination is helpful in the laboratory confirmation of a mumps case.

IgM/IgG testing

- Collect 7-10 ml of blood in a red top or serum separator tube (SST).
- Serum should be collected as soon as possible after onset of parotitis for IgM testing or as the acute-phase specimen for determining seroconversion.
- If initial testing is negative and mumps is strongly suspected, a convalescent serum sample should be collected 2-3 weeks after symptom onset.

IgM interpretation

- In unvaccinated persons, IgM antibody is detectable within 5 days after onset of symptoms, reaches a maximum level about a week after onset, and remains elevated for several weeks or months.
- In either vaccinated or unvaccinated people, a positive IgM test result indicates current/very recent infection or reinfection.
- If the acute specimen is IgM positive, a second specimen is not necessary.
- If an acute specimen collected ≤3 days after parotitis onset in an unvaccinated person is IgM negative, testing a second sample collected 5–7 days after symptom onset is recommended, since the IgM response may require more time to develop. A second negative IgM result does not rule out mumps unless the IgG is also negative.
- False positive mumps IgM results can occur due to parainfluenza virus 1, 2, and 3, Epstein-Barr virus, adenovirus, and human herpesvirus 6 infections.

Interpretation of IgM (-) results in vaccinated people

- The absence of a mumps IgM response in a vaccinated or previously infected person presenting with clinically compatible mumps symptoms *does not rule out mumps* as a diagnosis.
- In vaccinated people, IgM may be falsely negative. As with measles and rubella, mumps IgM may be transient, late occurring, or missing in persons who have had any doses of mumps-containing vaccine.
- There is some evidence that serum collected ≥10 days after parotitis onset may improve the ability to detect IgM among persons who have received 1 or 2 doses of MMR. However, vaccinated persons may not have detectable mumps IgM antibody regardless of the timing of specimen collection.

IgG interpretation

- In unvaccinated persons, IgG antibody increases rapidly after onset of symptoms and is long-lasting.
- In vaccinated persons, existing IgG antibody will begin to rise soon after exposure and infection and IgG may be quite elevated in the acute-phase blood sample, which may obviate the fourfold rise in IgG titer in the convalescent serum specimen.

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More materials on mumps are available at: http://www.cdph.ca.gov/HealthInfo/discond/Pages/Mumps.aspx

- Paired acute and convalescent serum specimens that demonstrate a fourfold increase in IgG titer or a seroconversion from IgG negative to positive are considered positive diagnostic test results for mumps.
- Paired serum samples from vaccinated persons, even if appropriately timed, may not show a rise in IgG titer.
- Prior immunologic experience with mumps, either from childhood disease or from vaccination, may be documented by the presence of mumps IgG antibody.

PCR and viral culture

- A buccal swab is the preferred specimen. Particularly among suspected cases with a history of vaccination, the early collection of buccal swabs provides the best means of laboratory confirmation.
- Collect buccal swab specimen as soon as mumps is suspected, preferably within 3 days and no later than 10 days after symptom onset. If mumps virus is not detected, specimens that are submitted to VRDL will be tested for other viral agents known to cause parotitis.
- Urine samples are less likely than oral specimens to contain sufficient viral copies or virus-infected cells and are therefore not preferred.

Buccal swab collection

- To obtain a buccal specimen, massage the parotid gland area (the space between the cheek and teeth inside the mouth just below the ear) on each side of the face for about 30 seconds prior to collection of the buccal secretions.
- Use a plain Dacron swab and rub the inside of each cheek with the same swab for about 10 seconds.
- Sweep the swab between the upper and lower molar areas on each side of the mouth.
- Ensure that the swab is moist with saliva when finished swabbing and place swab in a tube containing 2-3 mls of viral transport medium (VTM) or cell culture medium (MEM or Hanks Balanced Salt Solution) or other sterile isotonic solution (phosphate buffered saline).

Buccal Specimen storage and shipping

Buccal specimens should be stored and shipped cold (4°C) using ice packs as soon as possible.

If there will be more than a 1 day delay in shipping specimens, the buccal swab is best preserved at -70C and shipped on dry ice. Avoid freeze-thaw cycles.

Please call VRDL at 510-307-8585 with any viral laboratory testing questions and see CDC information at: http://www.cdc.gov/mumps/clinical/qa-lab-test-infect.html

RT-PCR/viral culture interpretation

- While detection of viral RNA by RT-PCR confirms mumps infection, failure to detect mumps virus RNA by RT-PCR in samples from a person who meets the clinical case definition for mumps does not rule out mumps as a diagnosis. Vaccinated people may shed virus for a shorter period and might shed smaller amounts of virus.
- Virus may be isolated from the buccal mucosa from 6 days before until 10 days after parotitis onset.
- Maximal viral shedding, however, seems to occur during the first 5 days after onset of symptoms.
- Among vaccinated persons who become infected, detection of virus from the buccal mucosa by either RT-PCR or culture is more likely within the first few days after symptom onset.
- A positive RT-PCR result provides laboratory confirmation of mumps infection in persons with symptoms consistent with mumps who have not been vaccinated within 45 days.
- Failure to detect mumps virus RNA by RT-PCR in samples from a person who meets the clinical case definition for mumps does not rule out mumps as a diagnosis. Successful detection of mumps virus depends primarily on the timing of collection and the quality of the viral sample.
- Vaccinated people may shed virus for a shorter period and might shed smaller amounts of virus, thus degradation of the sample has greater consequences for successful detection of virus in such people. In outbreaks among two-dose vaccine recipients, mumps virus RNA was detected in samples from 30%–35% of case-patients if the samples were collected within the first 3 days following onset of parotitis; IgM antibody was detected in 13%–15% of these cases